STRUCTURAL AND OPTICAL STUDIES OF TITANIUM DIOXIDE FILMS DEPOSITED USING METALORGANIC DECOMPOSITION METHOD

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Abstract

Thin titanium dioxide films have several interesting properties and applications. The rutile phase of TiO2 is the densest crystalline structure of this oxide with a high refractive index of 2.7, making it suitable for optical and thermal applications. The anatase phase, however, has interesting photcatalytic properties making it favorable for applications involving fume detection.1 The present work involves the study of the deposition of titanium dioxide (TiO2) films by the metalorganic decomposition method (MOD), the analysis of their structure, and measurement of certain properties. Films of TiO2 were deposited using an ethylhexoxide based metal-organic solution on sapphire substrates by employing the MOD method. These thin films were then subsequently annealed at the appropriate temperatures to get either the rutile or anatase phases of the oxide. Rutherford Backscattering spectroscopy (RBS) and a profilometer were used to analyze the composition and thickness of the films. The structural investigations on the films were carried out using XRD, Raman spectroscopy (for phase), and ion channeling for epitaxial growth on the sapphire and location of doped impurities. Analyses show that micron thick oxide films deposited by the MOD method and subsequently annealed between 5500C to 7000C were stoichiometric. Films annealed at 5500C exhibited an anatase phase, while those annealed at 7000C preferred a rutile structure. This was independently confirmed using Raman spectroscopy analysis as well.

1K. Okimura and A. Shibata, Jpn. J. Appl. Phys. 36, 2840 (1997).

N.E. Harvey was supported by a NSF-REU grant No. EEC-0097736

Category

Session: *Materials Science*